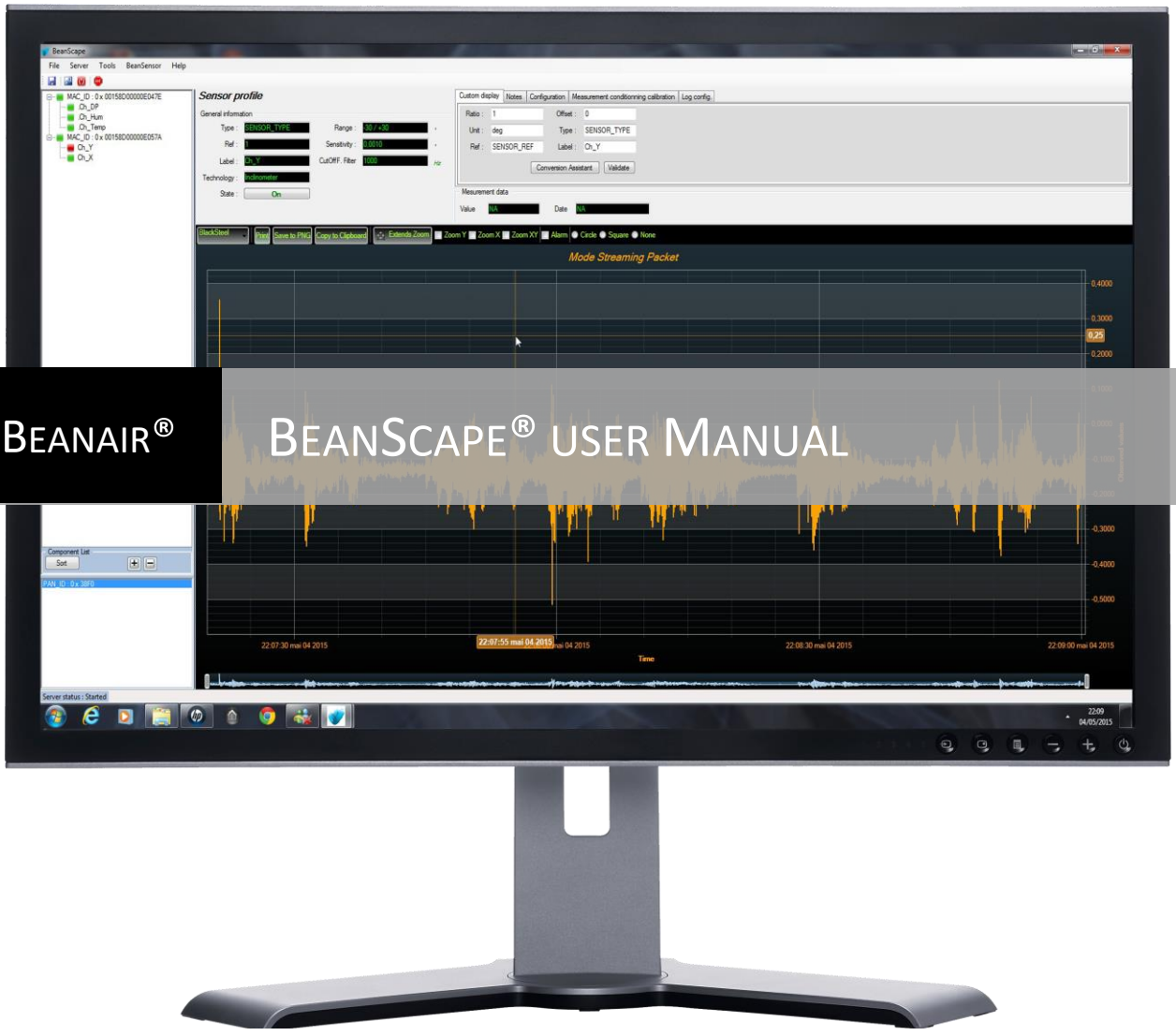
BeanScape®

Version 1.11



BEANAIR®

BEANSCAPE® USER MANUAL

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1. TECHNICAL SUPPORT

For general contact, technical support, to report documentation errors and to order manuals, contact ***BeanAir Technical Support Center*** (BTSC) at:

tech-support@beanair.com

For detailed information about where you can buy the BeanAir equipment/software or for recommendations on accessories and components visit:

www.beanair.com

To register for product news and announcements or for product questions contact BeanAir's Technical Support Center (BTSC).

Our aim is to make this user manual as helpful as possible. Keep us informed of your comments and suggestions for improvements.
BeanAir appreciates feedback from the users of our information.

2. VISUAL SYMBOLS DEFINITION

Symbols	*Definition*
	***Caution or Warning** – Alerts the user with important information about BeanAir wireless sensor networks (WSN), if this information is not followed, the equipment /software may fail or malfunction.*
	***Danger** – This information MUST be followed if not you may damage the equipment permanently or bodily injury may occur.*
	***Tip or Information** – Provides advice and suggestions that may be useful when installing BeanAir Wireless Sensor Networks.*

3. ACRONYMS AND ABBREVIATIONS

AES	Advanced Encryption Standard
CCA	Clear Channel Assessment
CSMA/CA	Carrier Sense Multiple Access/Collision Avoidance
GTS	Guaranteed Time-Slot
kSps	Kilo samples per second
LLC	Logical Link Control
LQI	Link quality indicator
LDCDA	Low duty cycle data acquisition
MAC	Media Access Control
PAN	Personal Area Network
PER	Packet error rate
RF	Radio Frequency
SD	Secure Digital
WSN	Wireless sensor Network

4. RELATED DOCUMENTS & VIDEOS

In addition to this User manual, please consult the related application notes, technical notes and videos:

4.1 APPLICATIONS NOTES

Document name (Click on the weblink)	*Related product*	*Description*
AN_RF_007 :" Beanair_WSN_Deployment"	All BeanAir products	Wireless sensor networks deployment guidelines
AN_RF_006 – „How to extend your wireless range"	All BeanAir products	A guideline very useful for extending your wireless range
AN_RF_005 – BeanGateway® & Data Terminal Equipment Interface	BeanGateway®	DTE interface Architecture on the BeanGateway®
AN_RF_004 – "Coexistence And Interferences@2.4GHz"	All BeanAir products	Coexistence & interferences of different RF technologies in the 2.4 GHz frequencies band.
AN_RF_003 - "IEEE 802.15.4 2.4 GHz Vs 868 MHz"	All BeanAir products	Comparison between 868 MHz frequency band and a 2.4 GHz frequency band.
AN_RF_002 – "Structural Health monitoring on bridges"	All BeanAir products	The aim of this document is to overview Beanair® products suited for bridge monitoring, their deployment, as well as their capacity and limits by overviewing various data acquisition modes available on each BeanDevice®.

4.2 TECHNICAL NOTES

Document name (Click on the weblink)	*Affected product*	*Description*
TN_RF_010 – « BeanDevice® Power Management »	All the BeanDevice®	This technical note describes the sleeping & active power mode on the BeanDevice®.
TN_RF_009 – « BeanGateway® management on LAN infrastructure »	BeanGateway®	BeanGateway® integration on a LAN infrastructure
TN_RF_008 – "Data acquisition modes available on the BeanDevice®"	All the BeanDevice®	Data acquisition modes available on the BeanDevice®
TN_RF_007 – "BeanDevice® DataLogger User Guide "	All the BeanDevice®	This document presents the DataLogger feature on the BeanDevice®
TN_RF_006 – "WSN Association process"	All the BeanDevice®	Description of the BeanDevice® network association
TN_RF_005 – "Pulse counter & binary data acquisition on the BeanDevice® SUN-BN"	BeanDevice® SUN-BN	This document presents Pulse counter (ex: energy metering application) and binary data acquisition features on the BeanDevice® SUN-BN.
TN_RF_004 - Ambient Light sensor technical specifications	BeanDevice® SUN-XX (Ecosensor)	Technical description of the Ambient light sensor available on the BeanDevice® SUN-XX products
RF_TN_003 V1.0- "Wireless Network capacity"	All the products	Network capacity characterization of Beanair Wireless Sensor Networks
RF_TN_002 V1.0 - Current consumption in active & sleeping mode	BeanDevice®	Current consumption estimation of the BeanDevice in active and sleeping mode
RF_TN_001 V1.0- Wireless range benchmarking	BeanDevice®	Wireless range benchmarking of the BeanDevice®

4.3 RELATED VIDEOS

All the videos are available on our Youtube channel

Beanair video link (Youtube)	Related products
Company Presentation	All
BeanGateway® - Ethernet Outdoor version introduction	BeanGateway® - Ethernet Outdoor version introduction
BeanGateway® – Ethernet Indoor version presentation	BeanGateway® Ethernet Indoor version
Beandevice® AN-XX wireless range demonstration	BeanDevice® AN-XX & Beandevice® AN-XX Extender
BeanDevice® AN-XX presentation	BeanDevice® AN-XX & Beandevice® AN-XX Extender
BeanDevice® AX-3D presentation	BeanDevice® AX-3D
BeanDevice® HI-INC presentation	BeanDevice® HI-INC
BeanDevice® AX-3DS presentation	BeanDevice® AX-3DS
BeanDevice® SUN-T presentation	BeanDevice® SUN-T
BeanDevice® SUN-TIR presentation	Beandevice® SUN-TIR
BeanDevice® SUN-BN presentation	BeanDevice® SUN-BN
BeanDevice® SUN presentation	BeanDevice® SUN
BeanScape® – WSN supervision software	BeanScape®
BeanGateway® Ethernet/LAN Configuration, directly connected to the Laptop/PC	BeanGateway®
Performing an energy scan on your BeanGateway®	BeanGateway®
Automatic RF Channel selection	BeanGateway®
Wireless sensors profile deletion from the BeanGateway® Database	All
Network Diagnostic configuration on the BeanGateway®	BeanGateway®
RF Power configuration on the BeanGateway®	BeanGateway®

5. SYSTEM OVERVIEW

BeanScape® software is suitable for monitoring and configuring BeanAir wireless sensor networks. It is exclusively developed by our R&D team in order to offer users application efficient, flexible and robust software.

BeanScape® provides the following features:

- ✓ ***Monitoring wireless sensor networks.***
- ✓ ***Displaying configured alarms of different wireless networks.***
- ✓ ***Sensors calibration and configuration***

- ✓ *OTAC (Over-the-air-configuration)*
- ✓ *Data and diagnosis analysis through curves and statistics*
- ✓ *Ability to store measurements and diagnostic information in a database as a LOG file*
- ✓ *Tools for optimizing the installation of wireless sensor networks*

The BeanScape® is a powerful software tool with client/server architecture. This implies that the network sensor communicates with the BeanScape® through a wireless coordinator called BeanGateway®. The BeanScape® acts as the server and the BeanGateway® acts as the client.

BeanAir ® network is comprised of a network coordinator (BeanGateway ®) and wireless sensors (BeanDevices®).

FEATURES	BeanScape Manager	BeanScape Basic	BeanScape Premium	BeanScape Premium+
Number of handled wireless sensor networks	1	1	Unlimited	Unlimited
Period technical assistance (e-mail)	1 Month	3 Months	6 Months	6 Months
OPC Server DA	No	No	No	Yes
Number of BeanDevice®	45	50	Unlimited	Unlimited
Real time data base	Yes	Yes	Yes	Yes
GUI (Graphical User Interface)	No	Yes	Yes	Yes
Free of cost ?	Yes	No	No	No

Figure 1 : the different versions of BeanScape® software

BeanScape® manager is not provided with a real-time graph display.

6. HARDWARE & SOFTWARE COMPATIBILITY

6.1 COMPATIBLE OPERATING SYSTEMS

The BeanScape® is compatible with many operating systems:

Operating Systems	*Compatibility*	*Tested/Certified*
Windows XP	*Yes*	*Yes*
Windows Vista	*Yes*	*Yes*
Windows 7 (32-bit)	*Yes*	*Yes*
Windows 7 (64-bit)	*Yes*	*Yes*
Windows 8 (32-bit/64-bit)	*Yes*	*Yes*
Windows 8.1 (32-bit/64-bit)	*Yes*	*Yes*

Table 1: Compatible operating systems

6.2 RECOMMENDED MINIMUM CONFIGURATION

Operating Systems	*BeanScape® Manager (streaming mode & streaming packet mode not enabled)*	*BeanScape® Basic (streaming mode & streaming packet mode not enabled)*	*BeanScape® Basic (streaming mode & streaming packet mode enabled)*	*BeanScape® Premium+*	*BeanScape® Premium*
CPU	*2.33GHz or faster x86-compatible processor*				
RAM memory	*1 GB*	*2 GB*	*4 GB*		
Disk Space	*5 GB*	*5 GB*	*10 GB*		
Graphic card	*128 MB*	*128 MB*	*1 GB*		

Table 2: Recommended minimum configuration

7. INSTALLING YOUR BEANSCAPE® SOFTWARE

Installing the Beanscape® software is very easy:

- ✓ Double click on "setup.exe" file (shown below) to launch BeanScape®

- ✓ Follow the different stages of installation
- ✓ When installing the software, a location for the log files is requested. These files are used to store all the data coming from the Wireless Sensor Network (information about the Network diagnostic, data acquisition of different wireless sensors, network acknowledgment etc).
- ✓ Click Finish to complete the installation of **BeanScape®**.
- ✓ The installation is now complete; the **BeanScape®** shortcut icon is now available on your desktop.

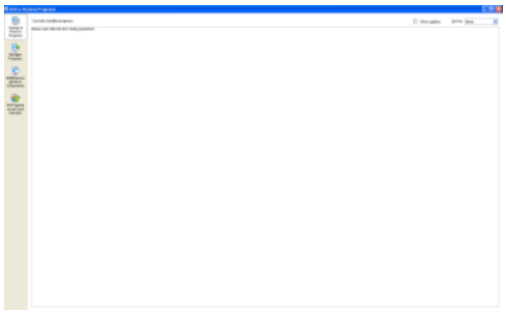
8. UNINSTALLING BEANSCAPE®

- ✓ To uninstall BeanScape®, follow these instructions:
- ✓ Click

- ✓ Then

- ✓ Double click on the icon

- ✓ You will see the following window :



- ✓ Select BeanScape® and click

- ✓ Follow the steps for uninstalling.
- ✓ Uninstall is now complete.

9. START YOUR APPLICATION

For further information on LAN Network configuration:

- *Read the following technical note: TN_RF_009 – « BeanGateway® management on LAN infrastructure »*

Related video: BeanGateway® Ethernet/LAN Configuration, directly connected to the Laptop/PC

9.1 ETHERNET CABLE CONNECTION

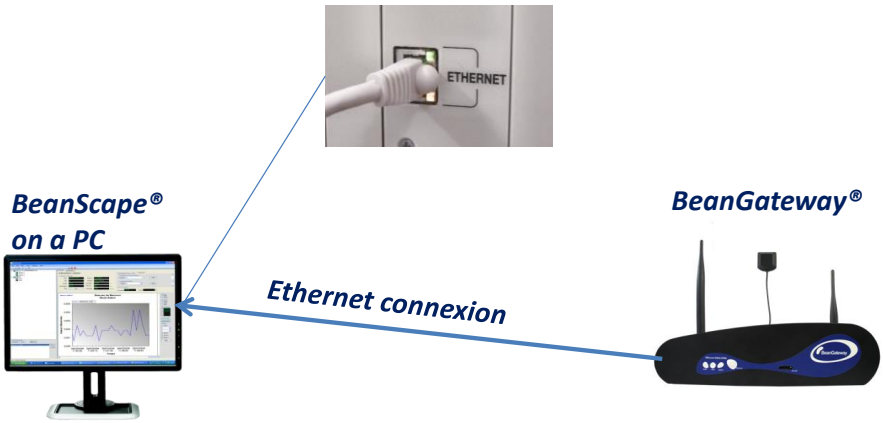


Figure 2: Typical LAN connection

To view the entire wireless sensor network from your ***BeanScape®***, you must firstly connect your ***Beangateway®*** to a PC where the ***BeanScape®*** is installed. Connection is established through an Ethernet cable.

- ✓ Make sure the Ethernet cable is connected to both your PC and ***BeanGateway®***
- ✓ Make sure your ***BeanGateway®*** is powered and in "ON" position.
- ✓ Make sure that your ***BeanScape®*** is installed on your PC

9.2 SETTING UP A NETWORK ON YOUR COMPUTER

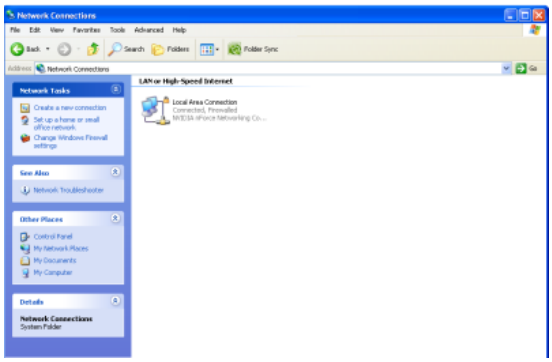
To configure the network on your computer/workstation:

- ✓ Click on

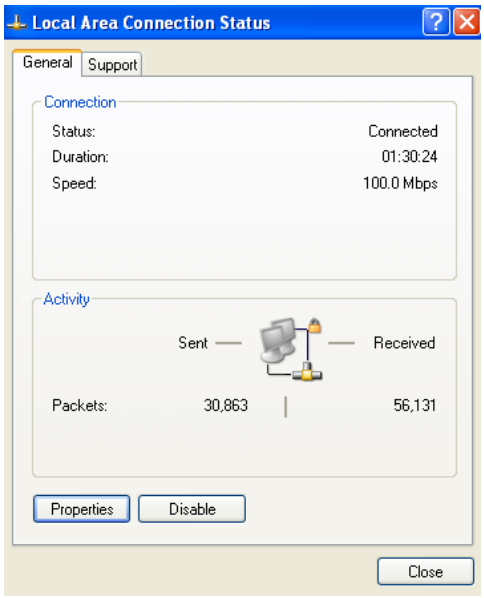
- ✓ Then on

- ✓ Double-click on

- ✓ You will see the following window

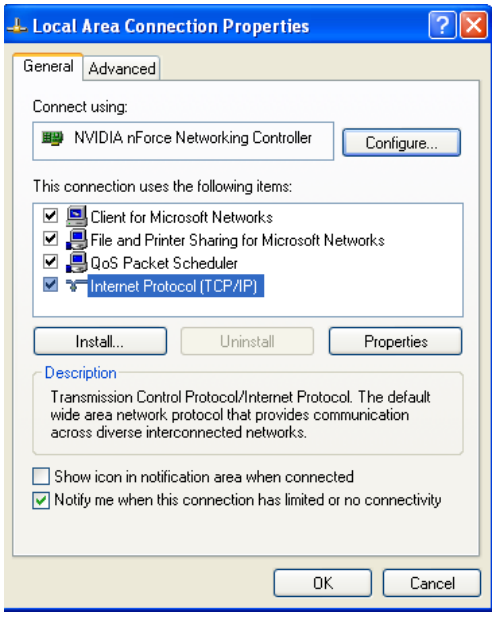


- ✓ Select the icon corresponding to the (NIC) network interface card on what you connected the BeanGateway®
- ✓ Double-click the icon.
- ✓ You get the following window:



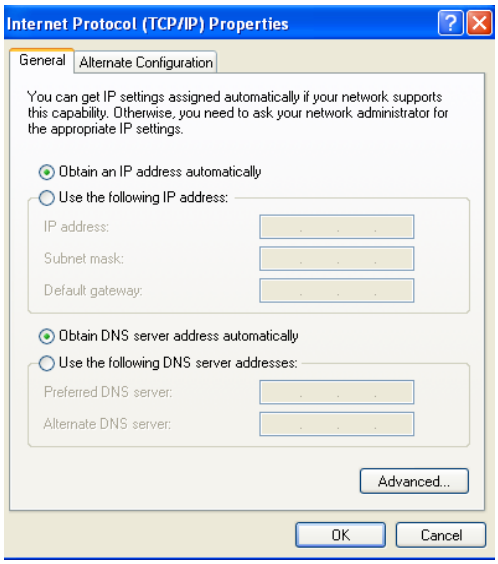
✓ Click on

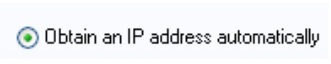
✓ You will see the following window:



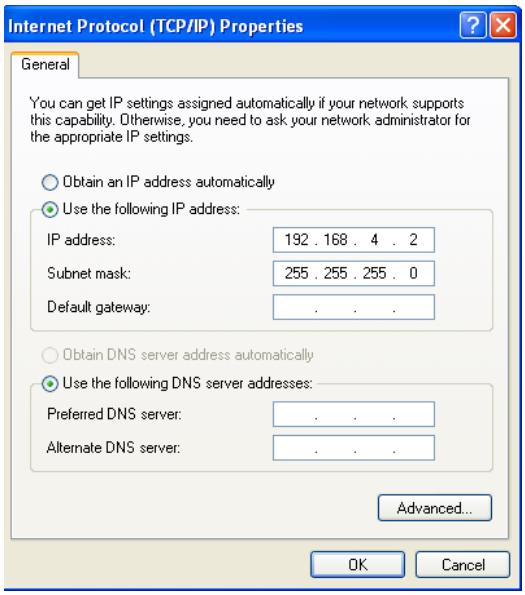
✓ Double click on

✓ You will see the following window :


Internet Protocol (TCP/IP) Properties
General
Alternate Configuration
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

- ✓ In case you set the DHCP active on your BeanGateway®, the BeanGateway® IP is directly obtained **by** the network**,** choose the option 

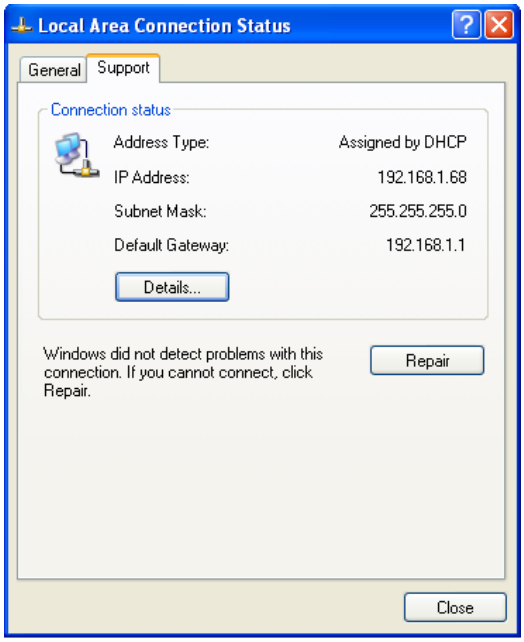
- ✓ If the DHCP option has not been activated, you must enter a static IP **192.168.4.2** on your PC with a subnet mask: 255.255.255.0.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 4 . 2
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

- ✓ Click "OK" to confirm and safeguard your work.
- ✓ Your computer is now connected to your wireless sensor networks. In order facilitate these exchanges you must give commands from BeanScape®.
- ✓ Reach the "Start" menu in the bottom left of the computer screen.
- ✓ The above image shows the start menu. Select the folder named "Control Panel ".

- ✓ You will find more information by opening Windows "Local Area Network Connection" and clicking on the Support tab.

- ✓ You will see the following window:



By default the BeanGateway® IP address is set at 192.168.4.123 with the DHCP disabled. The BeanGateway is considered as a client by the BeanScape ® (server) having the IP address by default set to 192.168.4.2.

9.3 FIREWALL COMPATIBILITY

Some firewalls will not permit applications such as BeanScape® (or any applications you have not specifically allowed) to access your BeanGateway®. Generally, the first time the BeanScape® or another application tries to access the BeanGateway®, you will be asked if you would like to allow that application access. If you accidentally clicked **No** on that message (or if your firewall never asked for permission to allow the BeanScape® access), you will not be able to use the BeanScape® until you configure your firewall to allow BeanScape® to access your BeanGateway®.

With most firewalls, this is easy to do. Keep in mind that all firewalls are a bit different, but the process is usually as follows:

1. Make sure that your BeanScape® is not running;

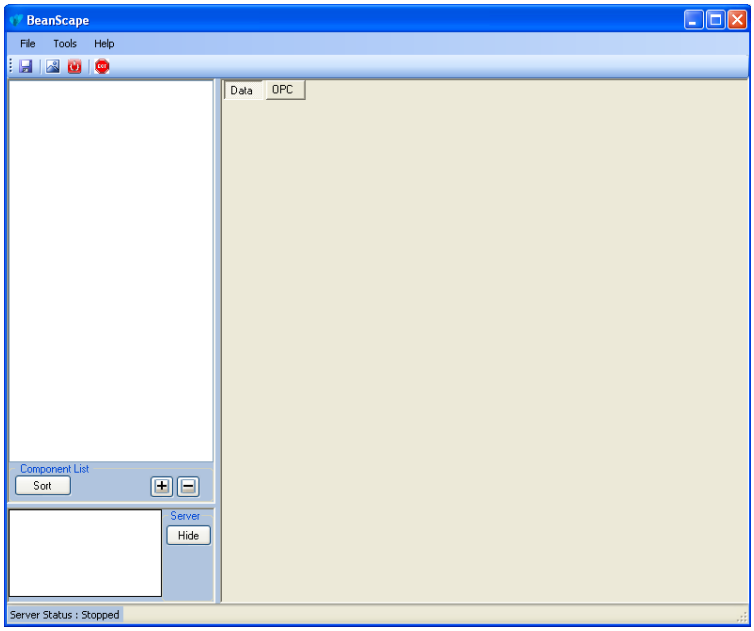
2. Open your firewall. If you can't find your firewall application, check the System Tray (at the bottom-right corner of the screen) for an icon. Usually, you can right-click this icon and select to open the firewall;
3. Your firewall maintains a list of applications installed on your computer (usually under a heading like Settings or Program Control). In this list, locate the entry for BeanScape®;
4. Configure the BeanScape® entry to allow it to connect to the BeanGateway®;
5. Save your modifications;
6. Restart the BeanScape® software

9.4 START THE BEANSCAPE®

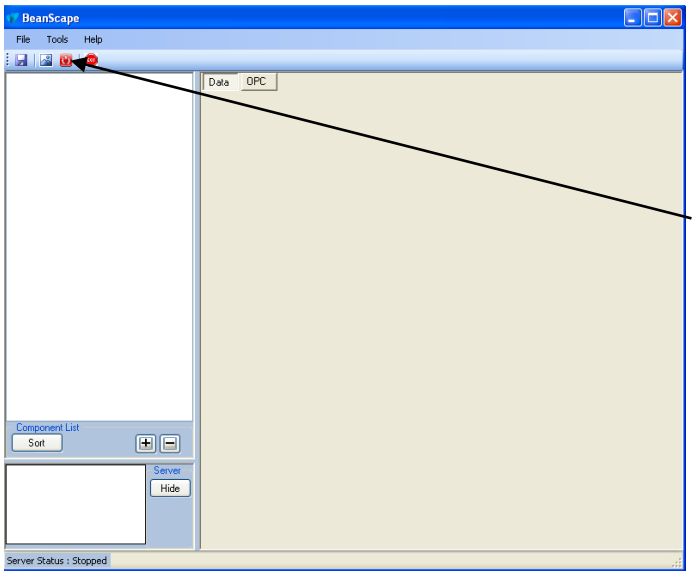
To start BeanScape ®, please follow the instructions:

- Start BeanScape ®by double-clicking the icon

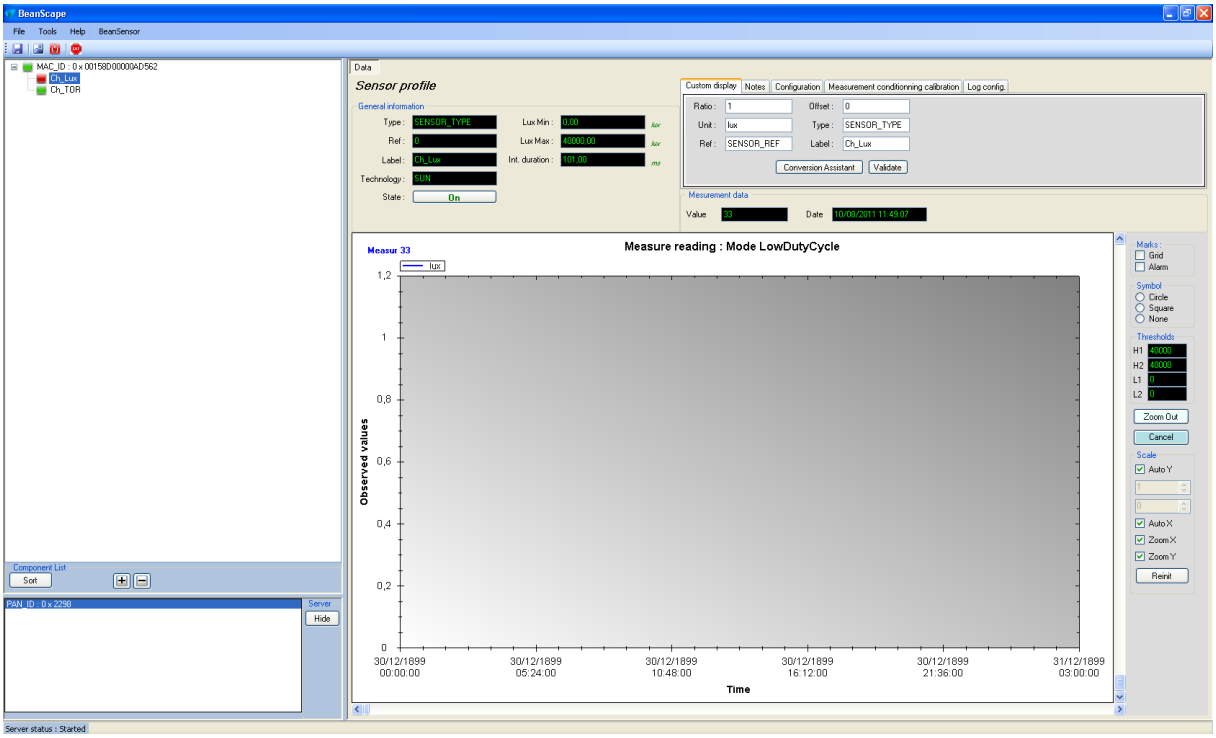
- You get the following screen:



- Start the server by clicking the Start button



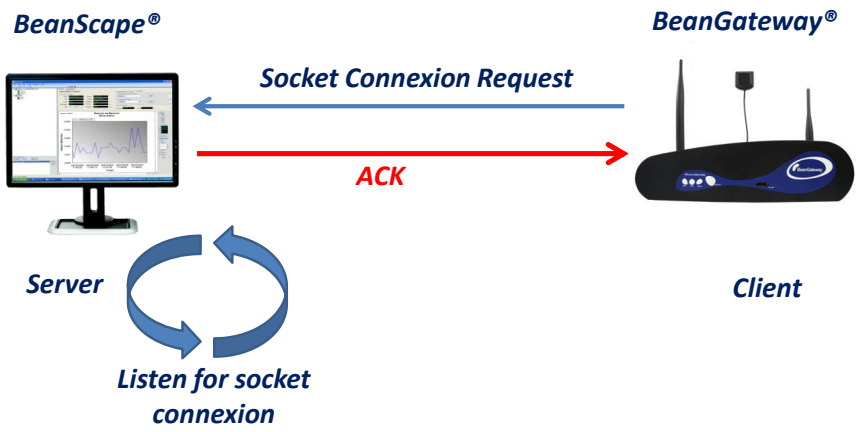
The BeanScape® server starts, and creates the BeanDevices® mapping based.



9.5 HOW THE CONNECTION IS ESTABLISHED BETWEEN THE BEANGATEWAY® AND THE BEANSCAPE® ?

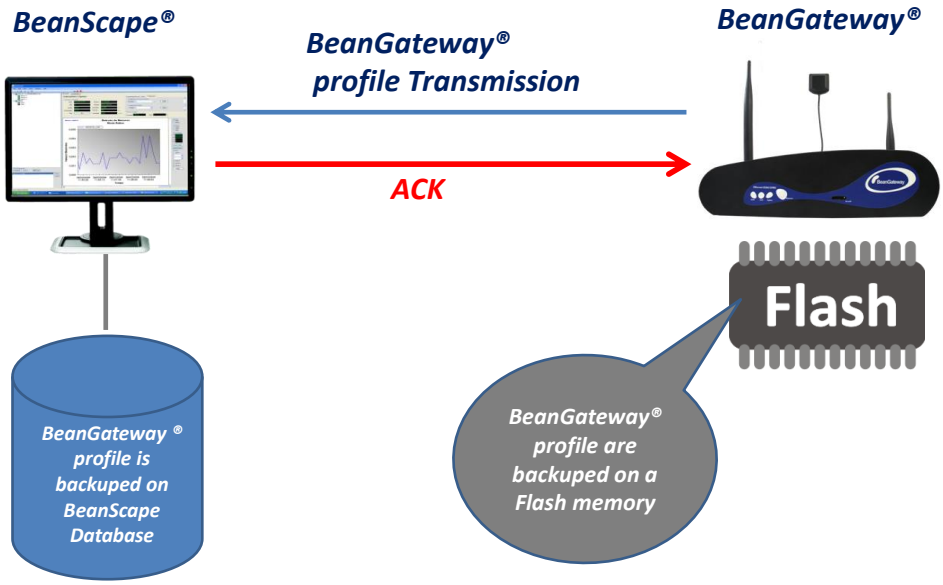
Step 1: Socket connexion

- When the BeanScape® is launched , as a server it starts with listening for a socket connexion
- When you power up the BeanGateway®, a request for socket connexion is established between the Beanscape® and the BeanGaterway®
- If this request is accepted by the BeanScape®, an ACK is transmitted to the BeanGateway®



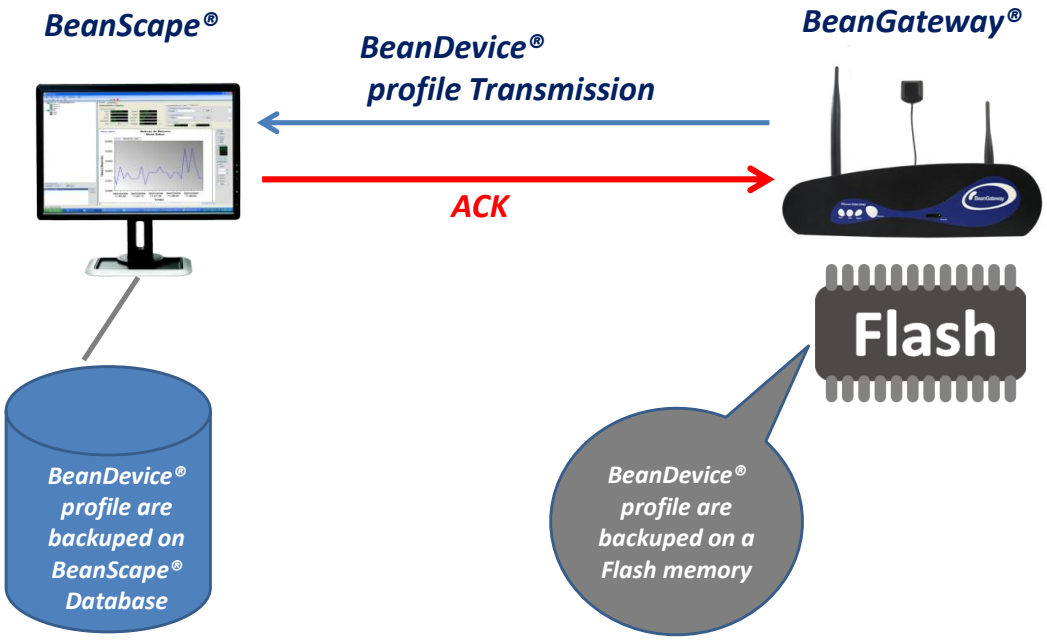
Step 2: BeanGateway® Profile Transmission

- The ***BeanGateway®*** profile is retained on its flash memory. This profile contains are the informations about the BeanGateway® ID (NWK Add, PAN ID, MAC ID, IP...) , versions ID (Hardware, embedded software, stack...), Radio Management parameters (Radio channel, TX Power, ...);
- The ***BeanGateway®*** profile is transmitted to the BeanScape®;



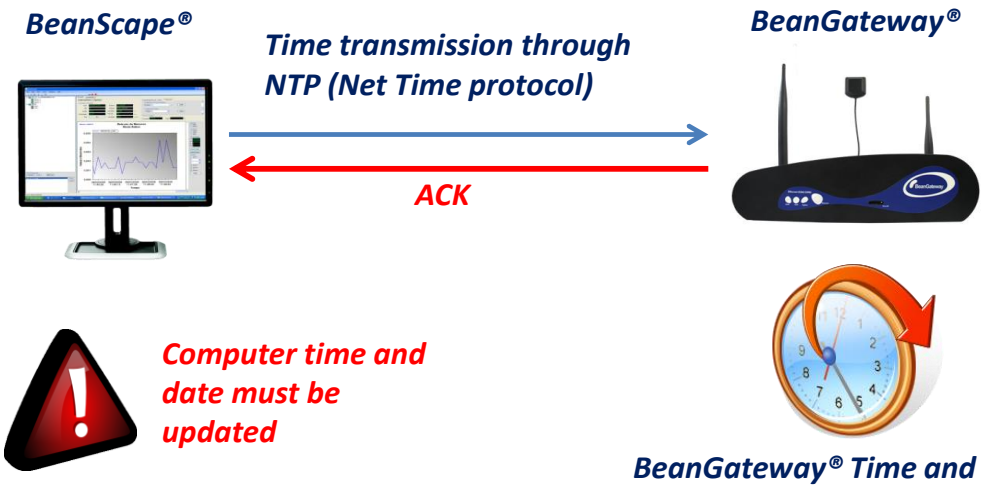
Step 3: WSN Mapping transmission

- The WSNmapping concerns all the Beandevice® profile. The WSN mapping is backuped on the BeanGateway® flash memory. When a new BeanDevice® joins a WSN, its profile is transmitted to the BeanGateway® and the BeanScape®.
- The BeanScape® displays the WSN Mapping with the BeanDevice® profile;
- WSN Mapping is backuped on the BeanScape® Database.



Step 4: Time & Date update

- Date transmission by NTP (Net-Time Protocole)
- Time & Date are updated on the BeanGateway instantly
- The BeanGateway integrates a Real-Time-Clock directly powered by th internal battery which allows to maintain the Time and Date if the BeanGateway® is power donw


BeanScape®
Time transmission through NTP (Net Time protocol)
BeanGateway®
ACK
Computer time and date must be updated
BeanGateway® Time and Date is synhcronized with your PC

The WSN Time & Date is synchronized with your PC. The User must make sure that the Time & Date on his computer is updated.

9.6 LAN/ETHERNET CONFIGURATION (FOR ADVANCED USER ONLY)

Click on the following weblink to see the video: BeanGateway® Ethernet/LAN Configuration, directly connected to the Laptop/PC

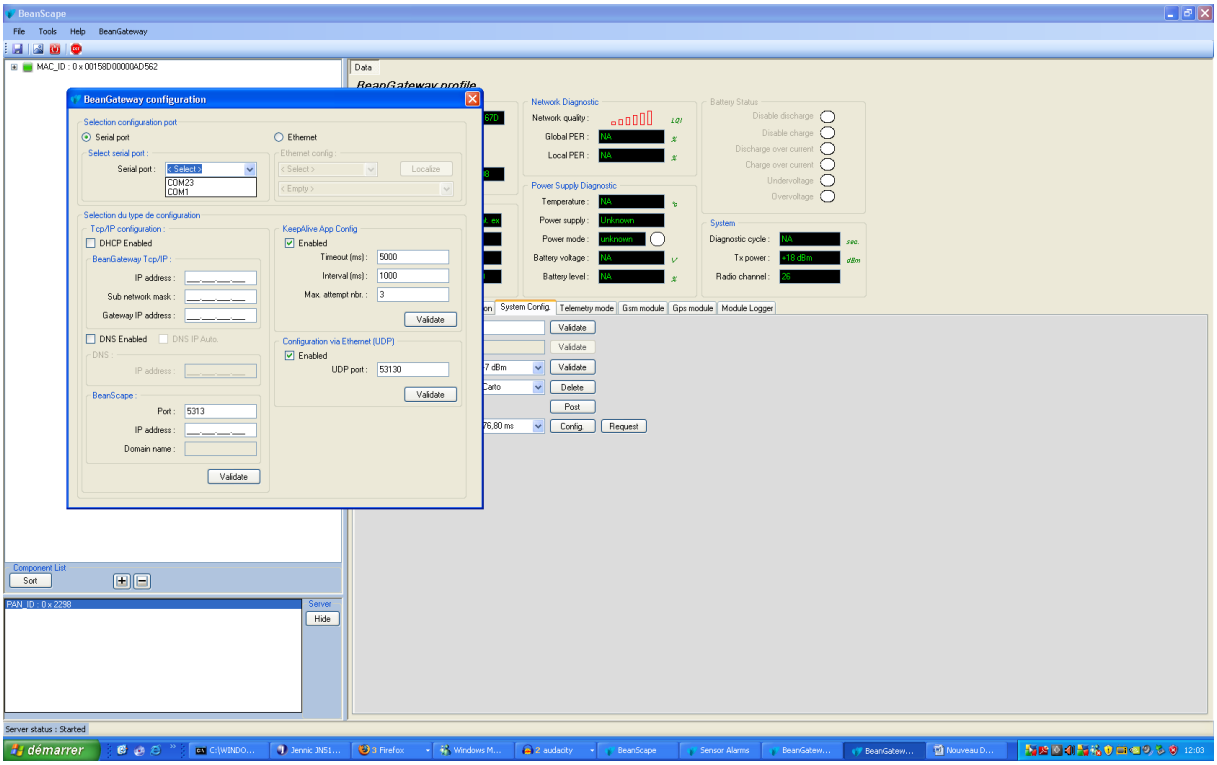
Please check your Network settings before you make any changes.

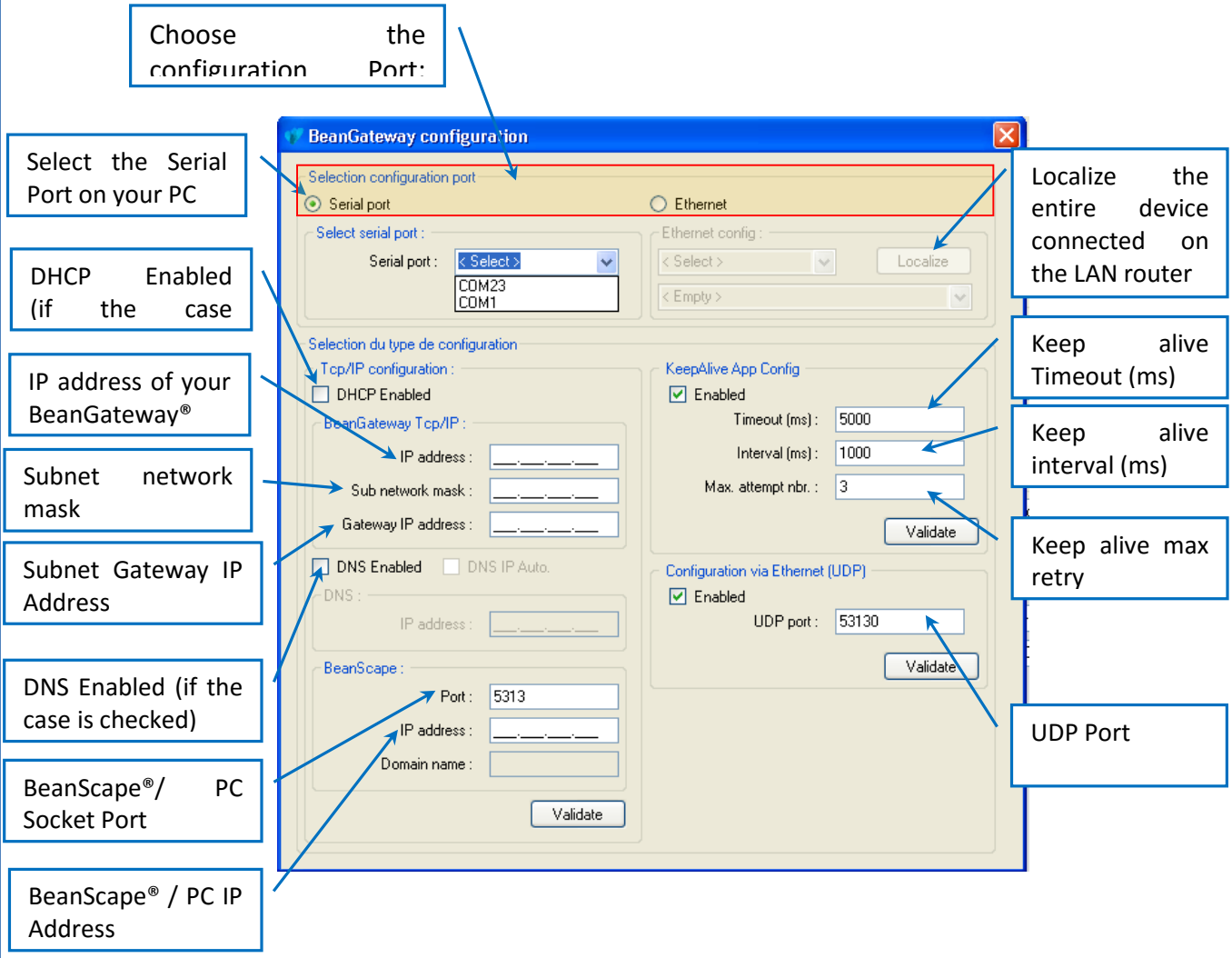
By default, the BeanGateway® is configured with a static IP address: **192.168.4.123**. This allows the user to connect fastly the Beangateway® to a PC.

If you want to set the BeanGateway® IP on your business network and get a dynamic IP address (via DHCP), you can configure the BeanGateway® via a serial port or via the Ethernet.

Go on your Beangateway® profile and click on Tools, then click on Beangateway config.

A new window will open called "Beangateway® configuration"





- ✓ ***DHCP Enabled***: Check this case if you want to enable the DHCP. For further informations about DHCP read the ***Technical Note "BeanGateway® management on your Local Area Network infrastructure".***
- ✓ ***If DHCP is not activated, the user must configure the Beangateway® IP parameters:***
  - ***IP Address:*** BeanGateway IP Address. The BeanGateway® IP address should have the following form: "X.Y.Z.B". With A, B, X, Y and Z numbers between 0 and 255
  - ***Subnet Network mask:*** The subnet mask is set to "255.255.255.0" by default
  - ***Gateway IP Address:*** Subnet network mask
- ✓ ***DNS Enabled***: Check this case if you want to enable the DNS. For further information about DNS read the ***Technical Note "BeanGateway® management on your Local Area Network infrastructure".***
- ✓ The gateway IP address subnet is the default "X.Y.Z.1"

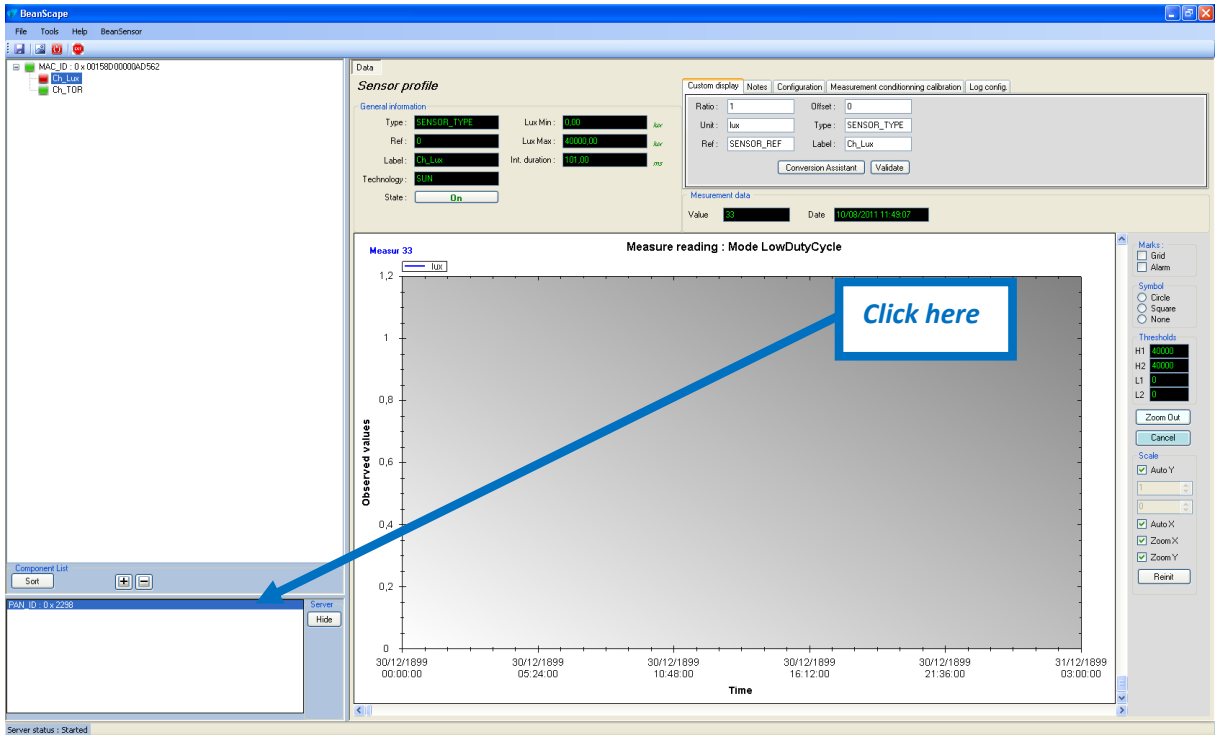
- ✓ ***Port***: By default the communication port used is "5313". This port is generally free, if not choose another Socket Port.

For further information, please read the following technical note – TN_RF_009 – « BeanGateway® management on LAN infrastructure »

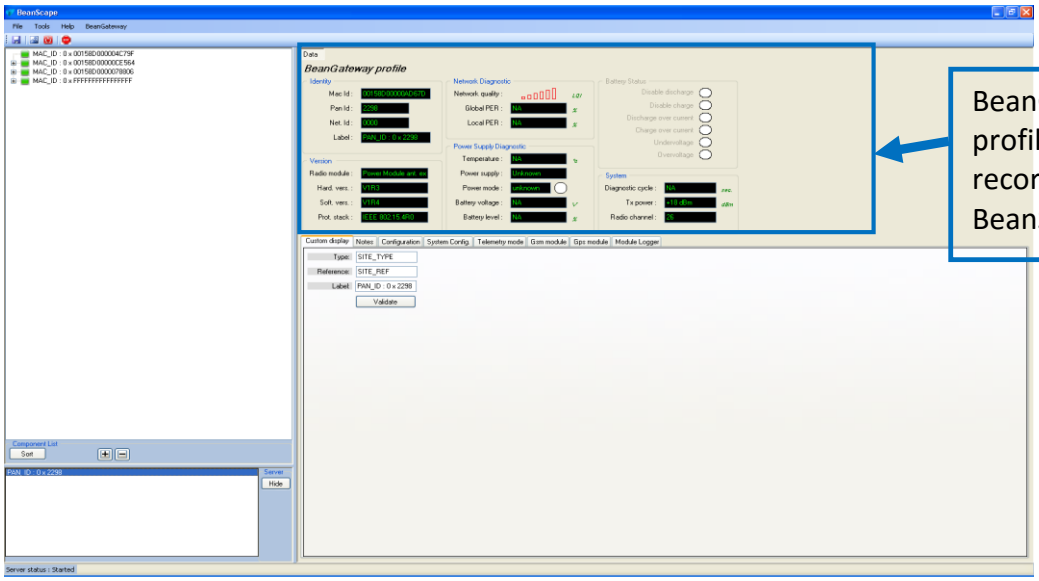
10. DEVICE PROFILE

10.1 BEANGATEWAY® PROFILE

The BeanGateway® is identified by its PAN ID and is located on the lower left window.



✓ You will see the following window:

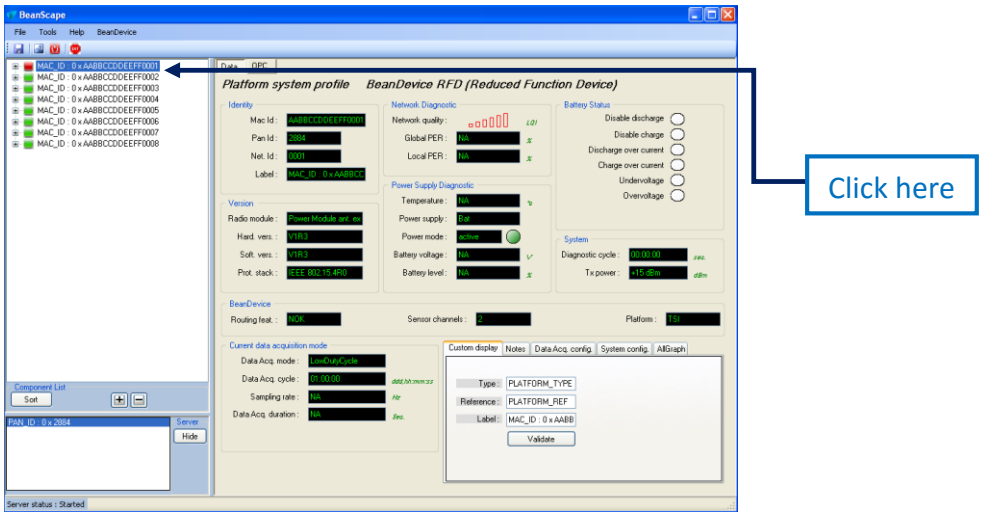


The values in green on the black background refer to the BeanGateway® current status.

For further information about the BeanGateway®, please read the BeanGateway® user manual.

10.2 BEANDEVICE® PROFILE

Click on the BeanDevice® folder tree on the left side pane, you will obtain all the information about your BeanDevice® connected to your network.

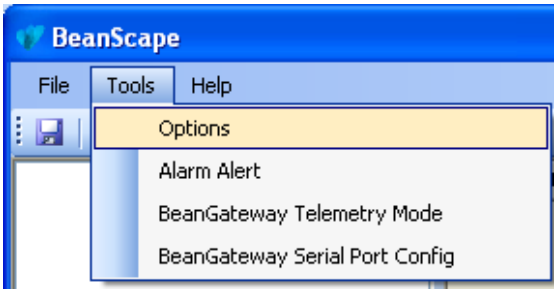


For further information about your BeanDevice®, please read the BeanDevice® user manual.

11. SYSTEM CONFIGURATION (FOR ADVANCED USER ONLY)

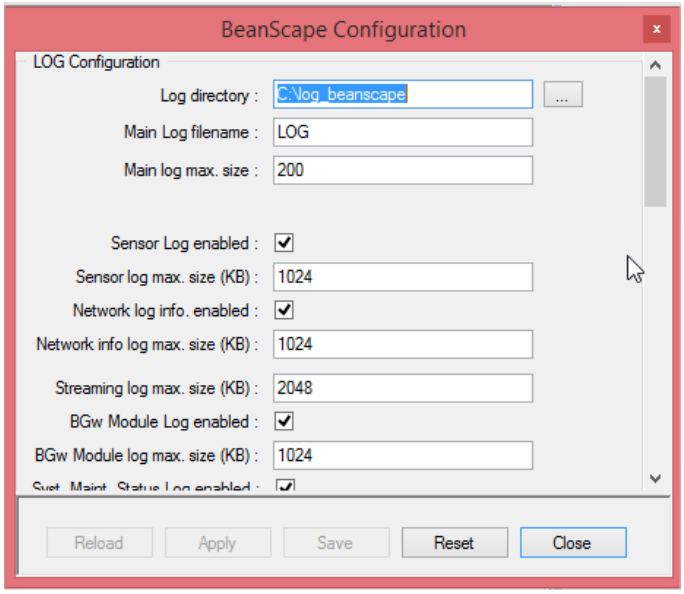
The following procedure applies only for advanced users

Click on the tab Tools then Options to configure advanced settings in ***BeanScape®***:



This window lets you configure the logs, data cache and Ethernet/LAN link between the BeanDevice® and the BeanGateway® .

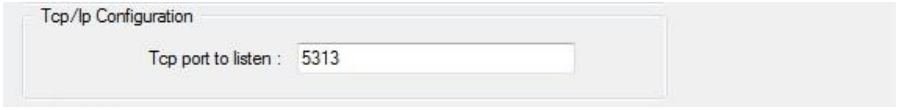
- ✓ A second window will appear:



- ✓ Clicking the button

reverts back to its original configuration.
- ✓ Logs & data cache configuration are described in the ***Beandevice® user manual***.

11.1 TCP/IP CONFIGURATION



Configure the TCP port number, by default to 5313 in order to listen.

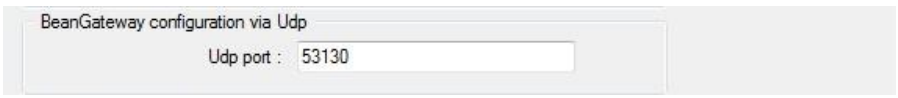
11.2 KEEP ALIVE APPLICATION

Three parameters related to Keepalive are available:

- **Keepalive time** is the duration between two keepalive transmissions in idle condition. TCP keepalive period is required to be configurable and by default is set to no less than 2 hours.
- **Keepalive interval** is the duration between two successive keepalive retransmissions, if acknowledgement to the previous keepalive transmission is not received.
- **Keepalive retry** is the number of retransmissions to be carried out before declaring that remote end is not available.

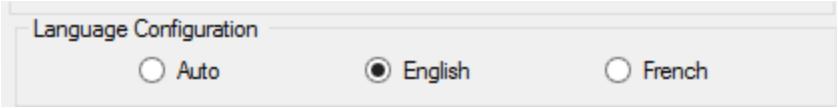
Keepalive packet contains null data. In a TCP/IP over Ethernet network, a keepalive frame is of 60 bytes, while acknowledge to this also null data frame and is of 54 bytes.

11.3 BEANGATEWAY® CONFIGURATION VIA UDP



Configure the UDP port number, by default to 53130 in order to listen.

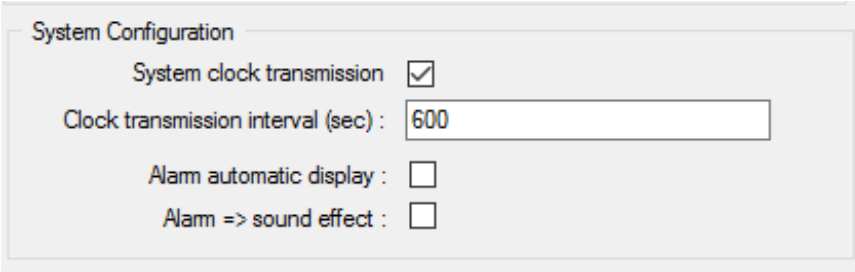
11.4 LANGUAGE CONFIGURATION



- ✓ ***Auto***: The BeanScape® will use the OS language by default
- ✓ ***English***: select English language
- ✓ ***French***: select French language

This configuration will be updated if the BeanScape® is restarted.

11.5 SYSTEM CONFIGURATION

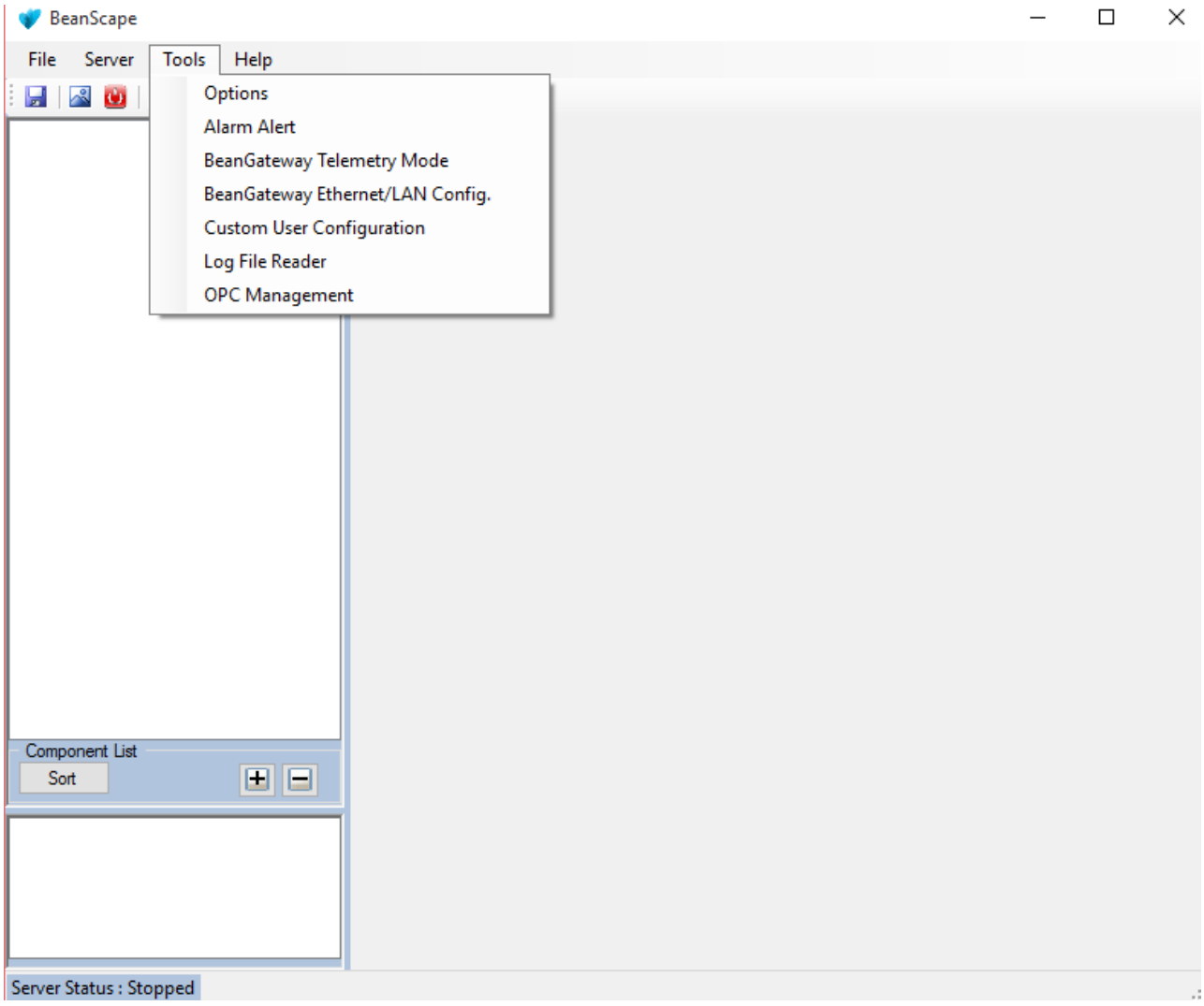


- ✓ ***Alarm automatic display***: Check this box if you want to see an alarm window displayed automatically when a window alarm threshold is exceeded.
- ✓ ***Alarm ➔ Sound Effect***: Check this box if you want to hear a sound effect when a threshold is exceeded.

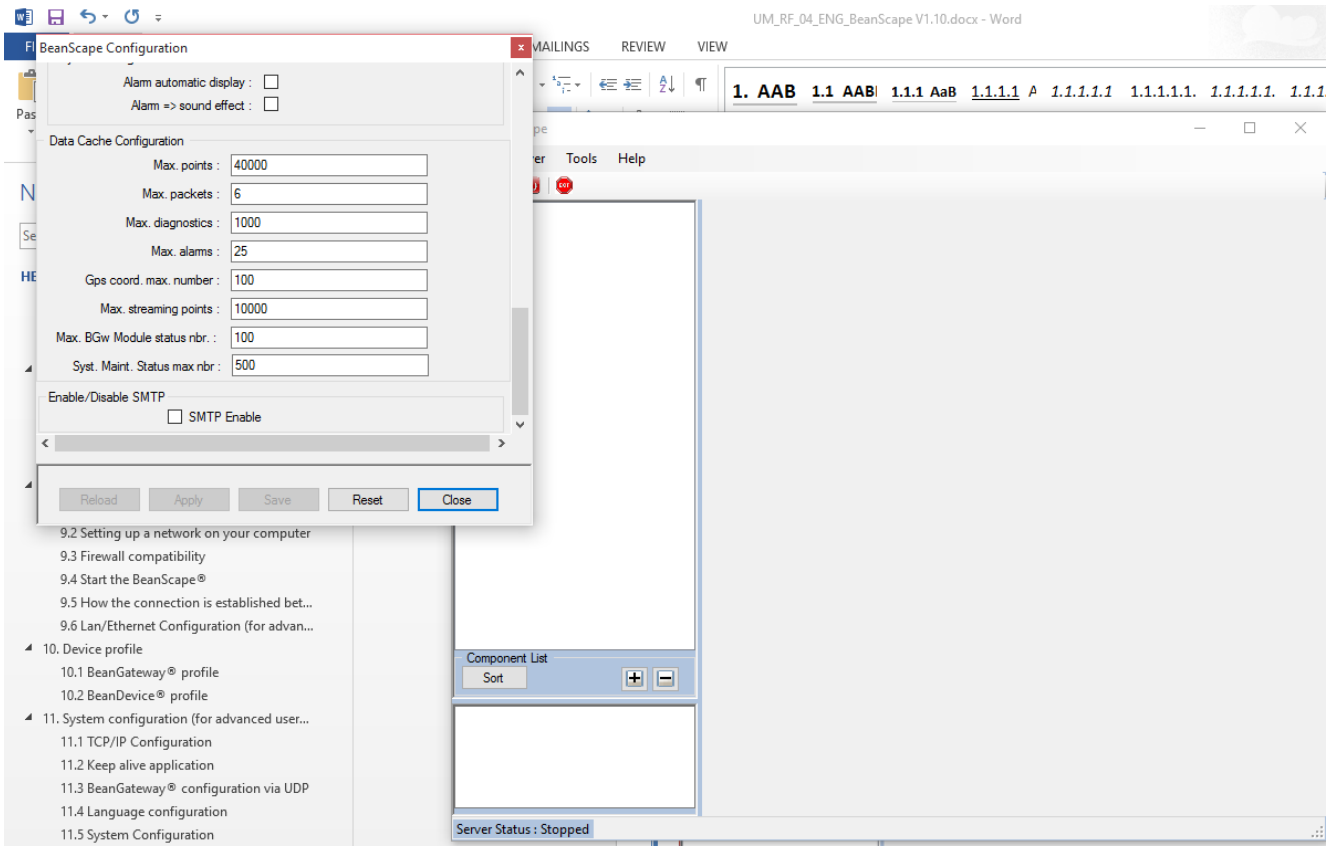
12. SMTP CLIENT

User can receive alarms notification by email. This function is only available with "***Alarm***" and "***Survey***" data acquisition mode.

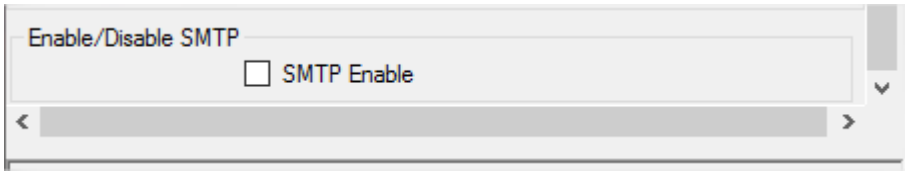
From your BeanScape® software click on "**Tools**" tab then "**options**".

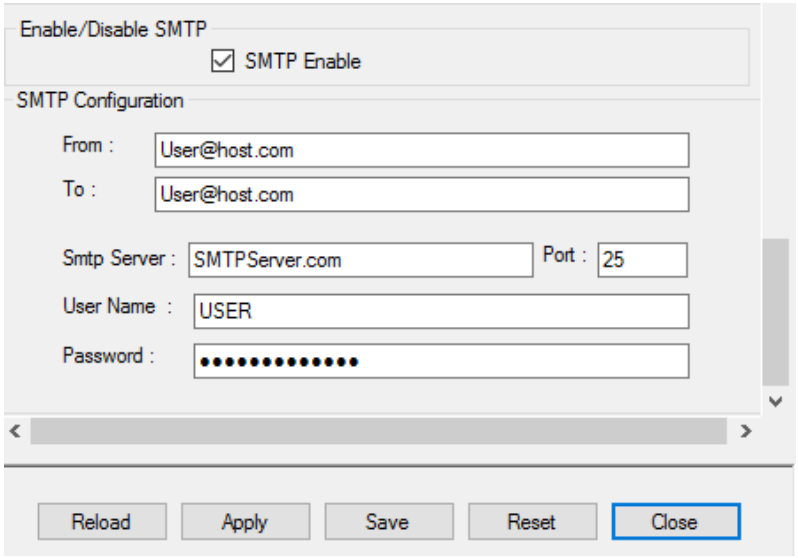


A new window will occur, use the scroll list and go to Enable/Disable SMTP field:



Click on SMTP Enable check box:





Fill out the following field:

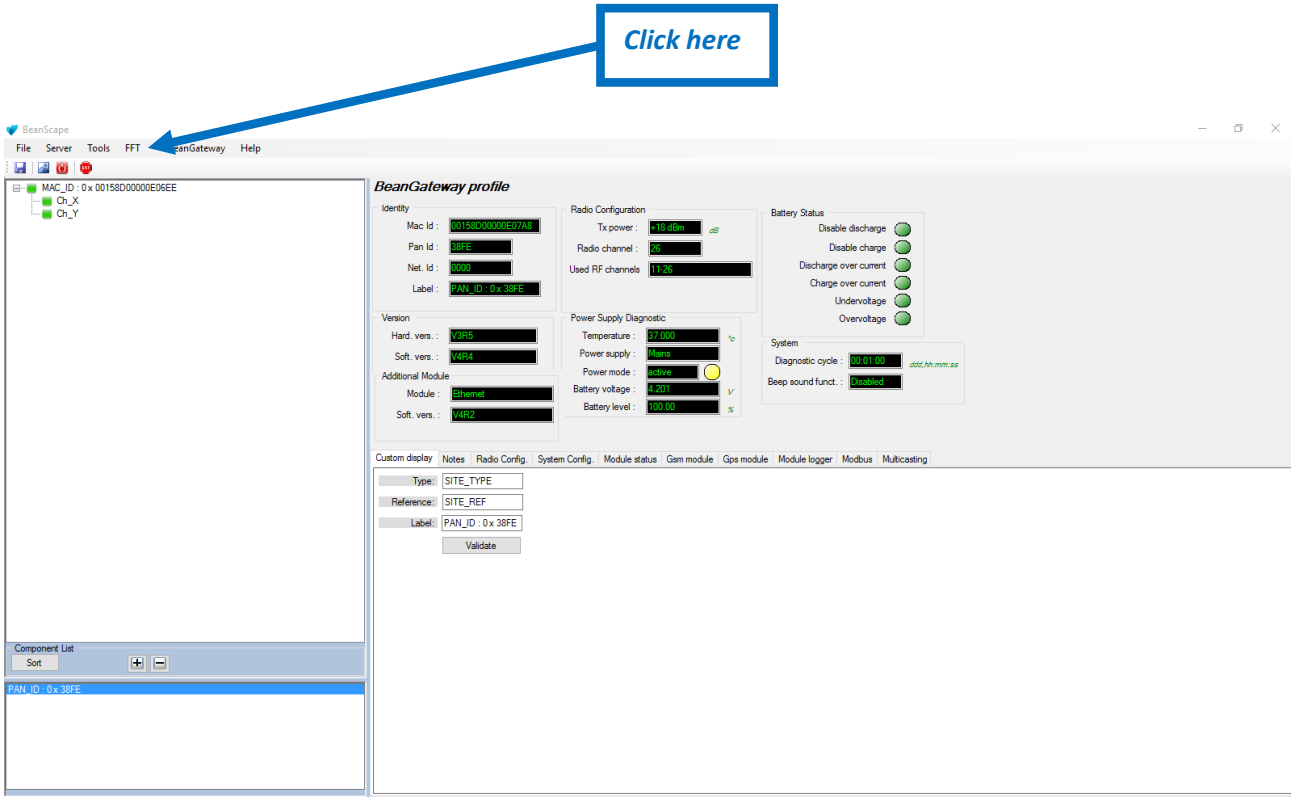
Field	*Description*
From	***Enter the email address sending the alarm notification***
To	***Enter the receiver address for alarm notification***
SMTP server	***Enter your Outgoing SMTP server***
Port	***Enter your port Number for your outgoing SMTP server***
User name	***Enter your full email address***
Password	***Enter the password (case sensitive) of your email account***

Click on "***Apply***" then "***Save***"

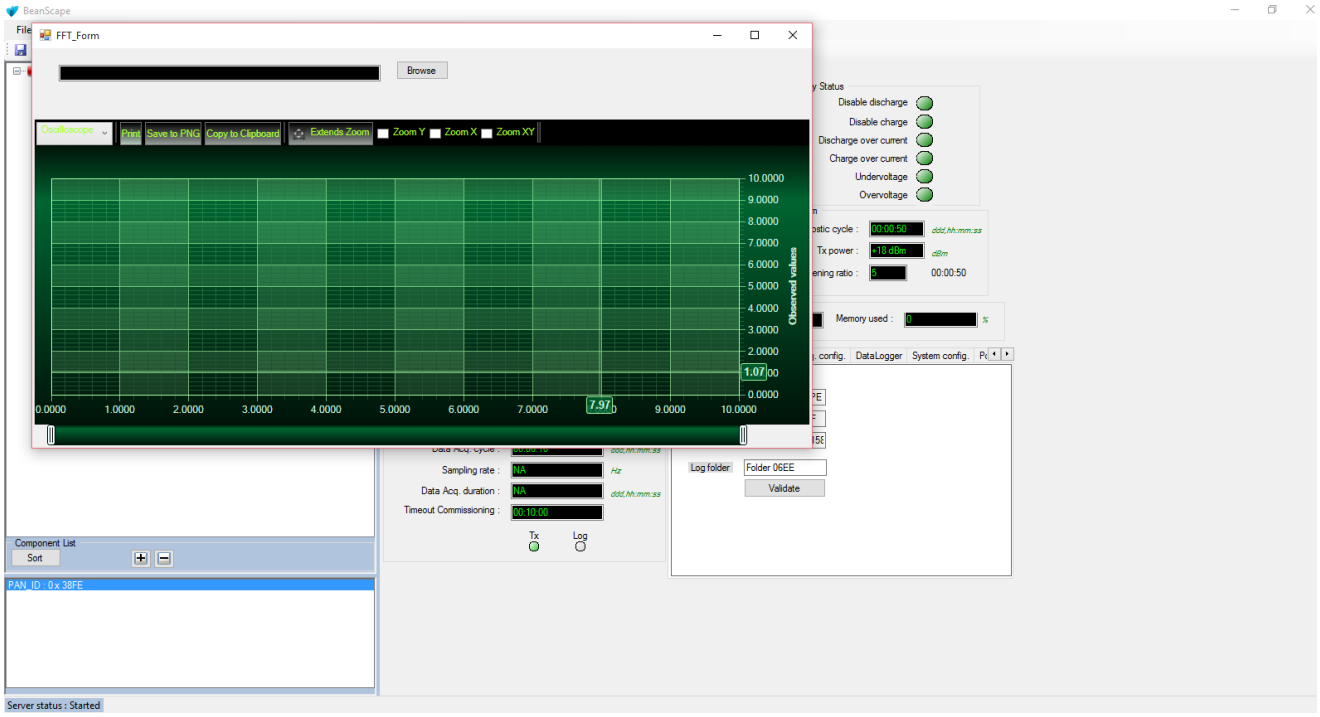
13. FFT (FAST FOURIER TRANSFORM) WAVEFORM ANALYSIS MODULE

The Fast Fourier Transform (FFT) resolves a time waveform into its sinusoidal components. The FFT takes a block of time-domain data and returns the frequency spectrum of the data. The FFT is a digital implementation of the Fourier transform. Thus, the FFT does not yield a continuous spectrum. Instead, the FFT returns a discrete spectrum, in which the frequency content of the waveform is resolved into a finite number of frequency lines, or bins.

FFT (Fast Fourier transform) module is only compatible with "Streaming" and "Streaming Packet" measurement mode.

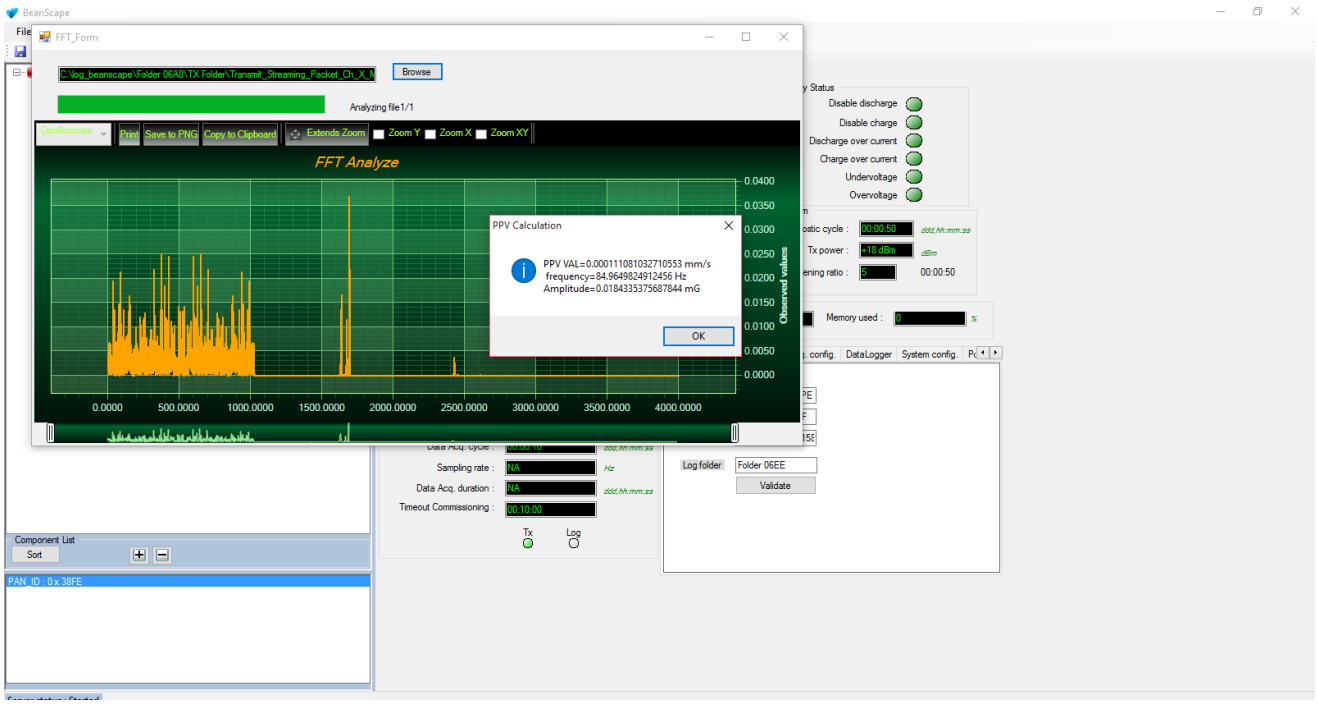


A new window will open:



Click on browse and import file containing the logged measurement, the result will be:

- Power spectral density and a new window displays
- PPV calculation: PPV value in mm/s , Frequency, Amplitude

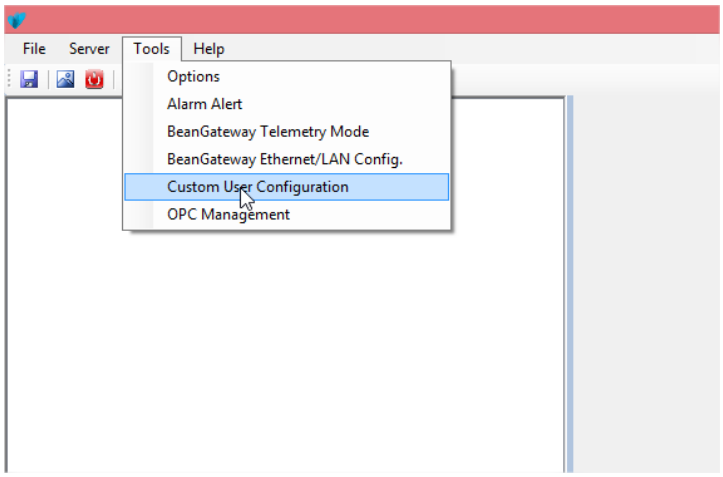


[Watch how FFT waveform analysis is performed]

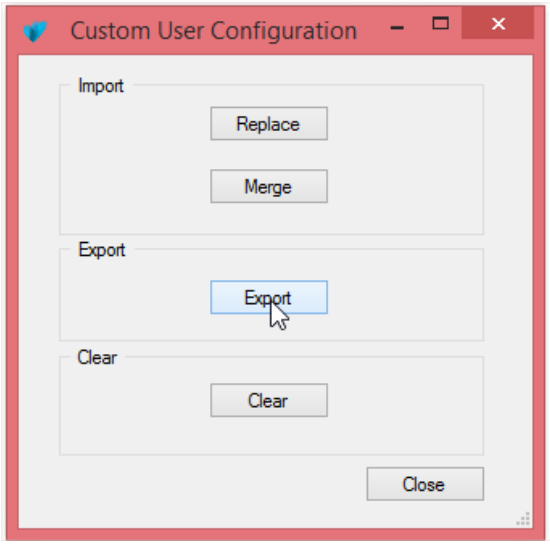
14. EXPORT/IMPORT USER CONFIGURATION (FOR ADVANCED USER ONLY)

14.1 EXPORT FUNCTION

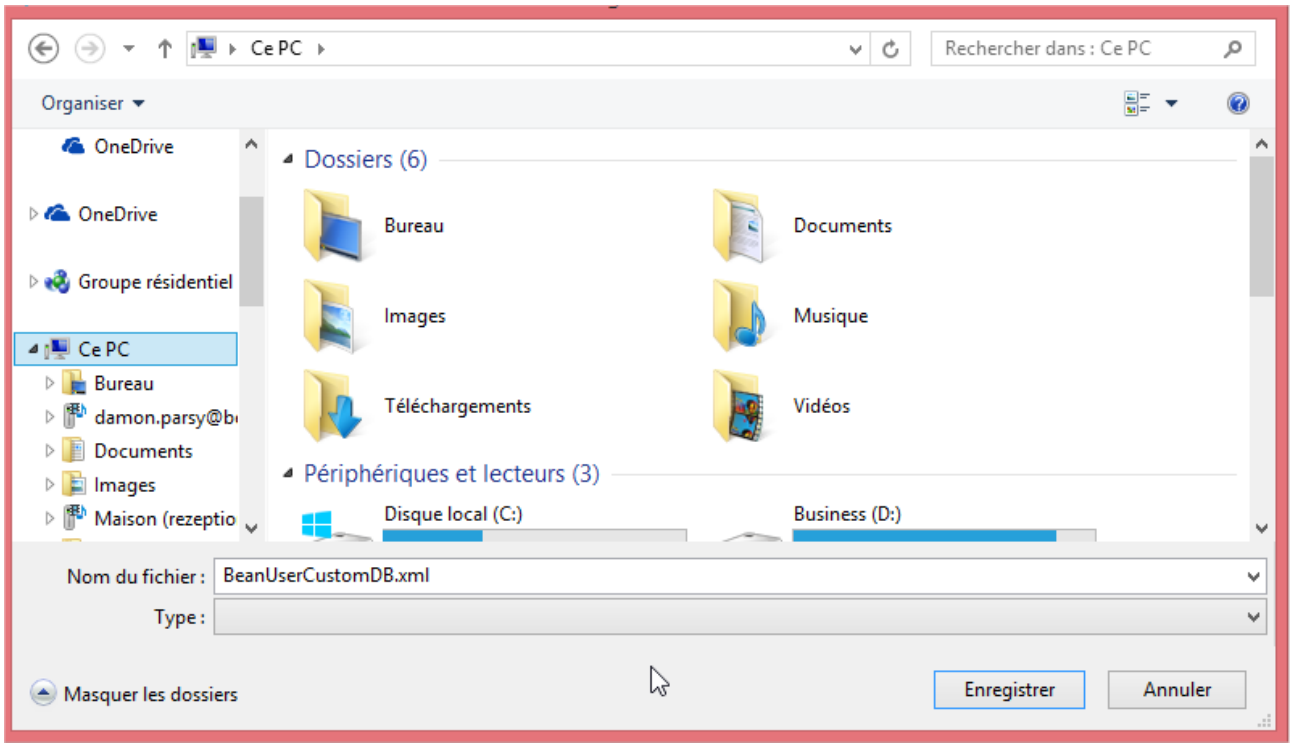
Click on the tab ***Tools*** then "***Custom user configuration***"



A new window will appear, click on ***export***:

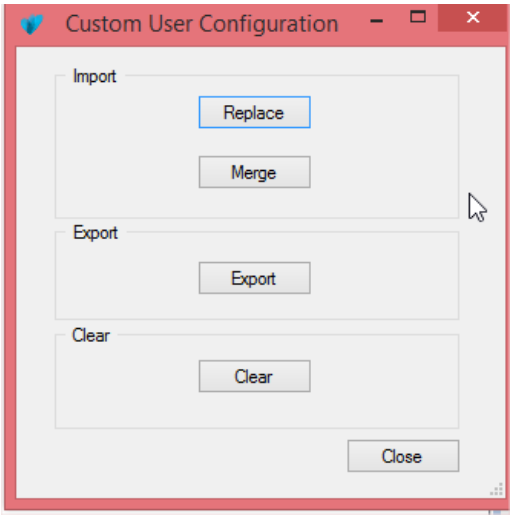


User configuration is exported in XML format:



14.2 IMPORT FUNCTION

Click on "***Replace***" to import user configuration:



Don't try to change manually the XML file, there is a high risk to corrupt it.